Successful Methods

Construction - Road Making - Engineering - Industrial - Mining

ROAD BUILDING IN COREA

Vol. 3 December 1921 No. 12

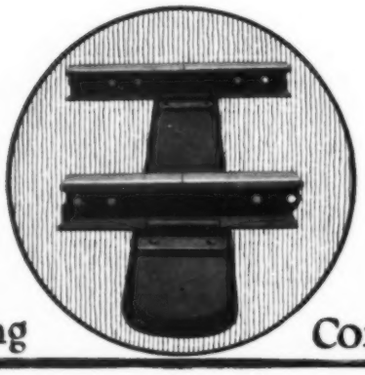
LAKEWOOD METHODS AND MACHINES

It Costs Less to Haul Batches with Lakewood Cars

The drawbar pull required to haul a string of Lakewood Batch Box Cars is reduced to the minimum by the use of roller bearings. That means lower hauling costs, and longer service without bearing replacement.

Lakewood tip-over steel batch boxes are made with separate, water tight, removable cement compartments. In actual service complete batches have stood on the job over night with no damage to the cement. It costs you less to haul in Lakewood Batch Box Cars.

Ask for the Road Plant Booklet



The Lakewood Engineering Company, Cleveland U.S.A.

Successful Methods

A Magazine of Construction Service

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Vol. III DECEMBER, 1921 No. 12

The Ox and the Power Machine

ON our front cover we show a picture of a road roller in Corea drawn by three yoke of oxen. Offhand it would appear that such motive power would be the most economical in that country. Indeed, other much more advanced countries of the world consider oxen the cheapest power on many kinds of construction work. But even in Corea the American motor road roller already is taking the place of crude outfits such as the one illustrated on our cover.

Just how rapidly modern plant and equipment will be adopted in countries where cattle, fodder and labor are cheap remains to be seen. Certainly there has been an astonishing change of opinion in such countries lately about the value of labor-saving machinery. An English engineer, for example, recently presented a paper on the subject before the British Institute of Mechanical Engineers. He pointed out that in some Oriental ports machinery for handling bulk materials had shown great economies over coolie labor. At that, the machinery he illustrated was by no means modern. The conclusions of this English engineer are confirmed by numerous similar evidences brought to the attention of this magazine in the last year or two. These concrete examples of the economy of labor-saving machinery in cheap-labor countries bring up the question:

What Is Cheap Labor?

Ask the average American contractor what cheap labor is. He will likely tell you "$1.50 for 10 hours' work." But in many parts of the world labor works for from one-fifth to one-tenth of that rate. After all, whether labor is cheap or expensive depends on how much it is paid to do a certain job properly in a given time.

It is significant that engineers in low-priced labor countries have lately given much consideration to the more extensive use of power-driven equipment on their work. All over the world construction managers, in particular, rapidly are awakening to the fact that cheap labor rates may mean necessarily high unit costs. Outside of the United States it has been common to consider that American plant and methods, developed here where labor rates are the highest in the world, were not usually applicable elsewhere. Careful study has shown that this is true only in very few cases.

One of the chief reasons is that low-priced labor rarely is cheap on most construction work. Kaffirs can be hired for about $8 a month in South Africa. An American construction man, recently back from there, tells us that the low-grade intellects of this labor make it worth just about that much, as compared with labor here at our rates. Americans who have handled Oriental coolie labor report the same opinions.

Talks with numerous Americans who have had long construction experience, both here and in low-priced labor countries, bring out the fact that these men use practically the same plant on their overseas jobs that they would use at home. American builders also are taking on more and more work abroad. They will undoubtedly set the pace for the world in the speed of handling such work. Their overhead will force that upon them. At the same time, their foreign competitors will have a chance to see that modern methods and equipment show good results whether labor rates are high or low.

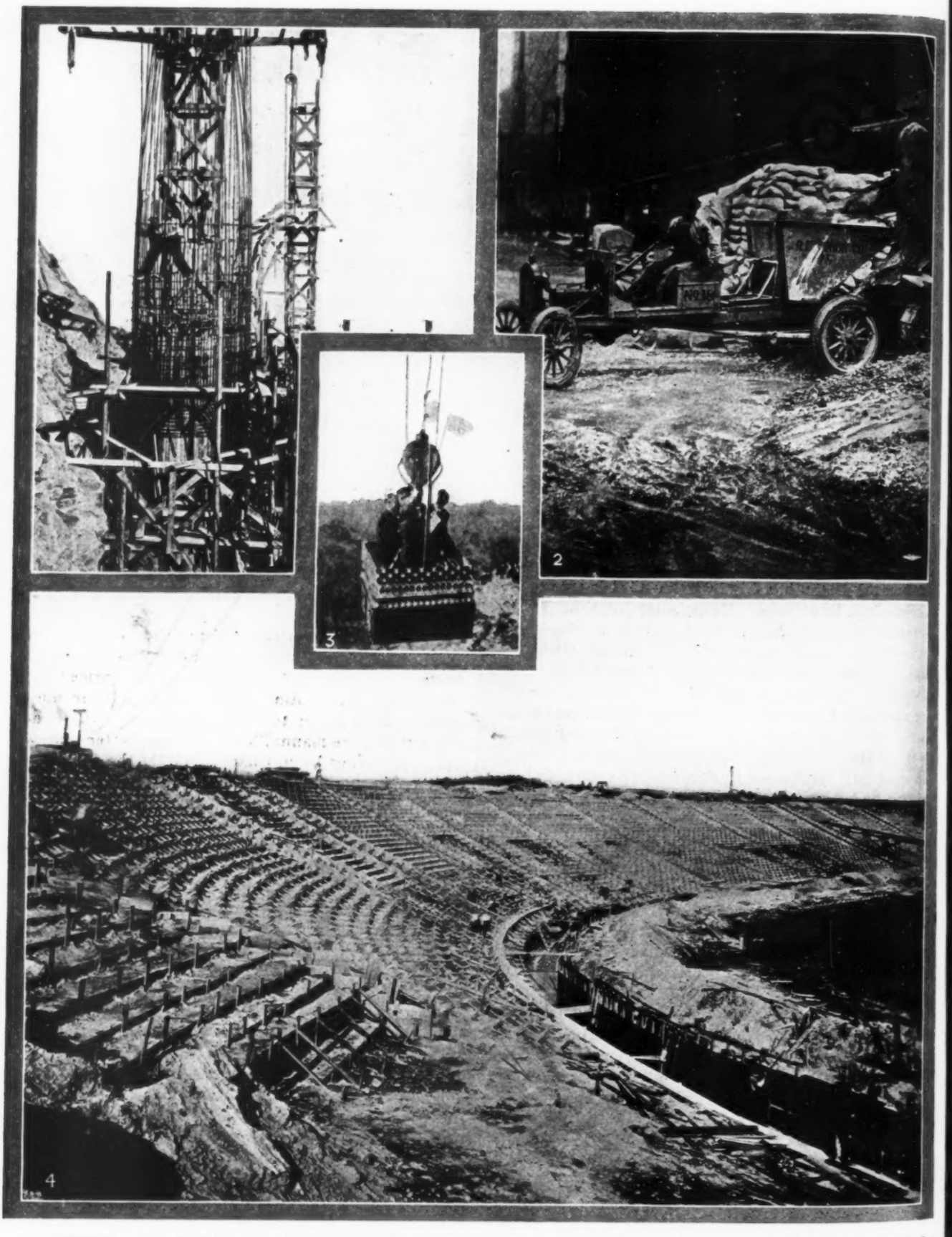
The average American construction man can draw another conclusion from this tendency to use the most modern methods and equipment in low-priced labor countries. Many Americans, consciously or unconsciously, are going to think that lower wages here mean that more manual labor will pay better than was the case during boom times. Exactly the contrary is true. This is due to the more strenuous competition and the demand for lower unit costs which comes with cheaper labor. One way to keep inside of close cost limits is to use the most modern methods, the very best of equipment and as good skilled labor as can be found. Concerns successful in the contracting business through good times and bad have demonstrated that these are the factors which make for success whether wages are high or low.

The Road Building Contest

ANNOUNCEMENT of the winners in the contest for the World's Championship Road Building conducted by SUCCESSFUL METHODS will be printed in the January issue. The entries closed Dec. 1, and it will take some time to check them and determine which outfits are entitled to the three money prizes which have been offered.

Contractors from every section of the country have sent in their entries and on the list are all of the men who have been doing record-breaking work. The winner of first prize undoubtedly will be the champion road builder of the year.

Builders Are Busy



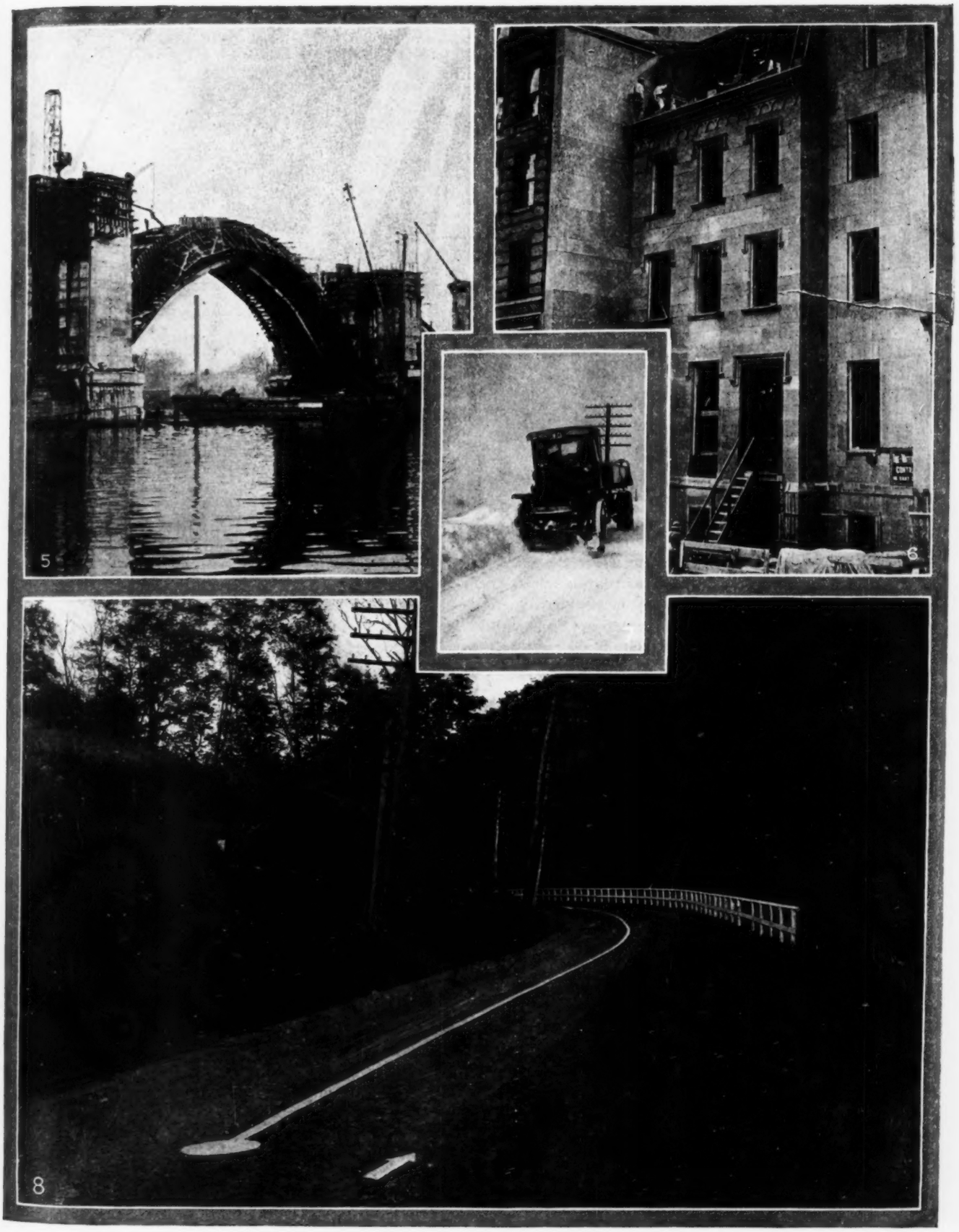
1—Building concrete chimneys in San Francisco. A wooden tower is erected in the center of the chimney and the outside forms are handled from two outriggers, which may be seen at the top of the photograph. © *Keystone Views.*

2—Repaving one of Chicago's busiest thoroughfares. This photograph was taken on State Street. © *Underwood & Underwood.*

3—Christening a dam in Arkansas. A pretty girl acted as sponsor and in order to perform her part of the ceremony, she was swung out over the dam in a bucket. © *International.*

4.—This great stadium is being built for the University of Washington at Seattle. © *Keystone Views.*

In East and West



5—The Key Bridge across the Potomac near Washington now under construction. © *Keystone Views.*

6—Restoring Theodore Roosevelt's birthplace on East Twentieth Street, New York City. It will be preserved as a permanent memorial. © *Keystone Views.*

7—How the Pennsylvania State Highway Department keeps the roads clear of snow.

8—Another step in the campaign for increased safety on highways. This Massachusetts road is so marked that the danger of accidents on the sharp curve is reduced to a minimum. © *Keystone Views.*

RAILROAD METHODS APPLIED TO HEAVY HIGHWAY CONSTRUCTION

Contractors on Pennsylvania Job Utilize Experience Gained in Railway Work

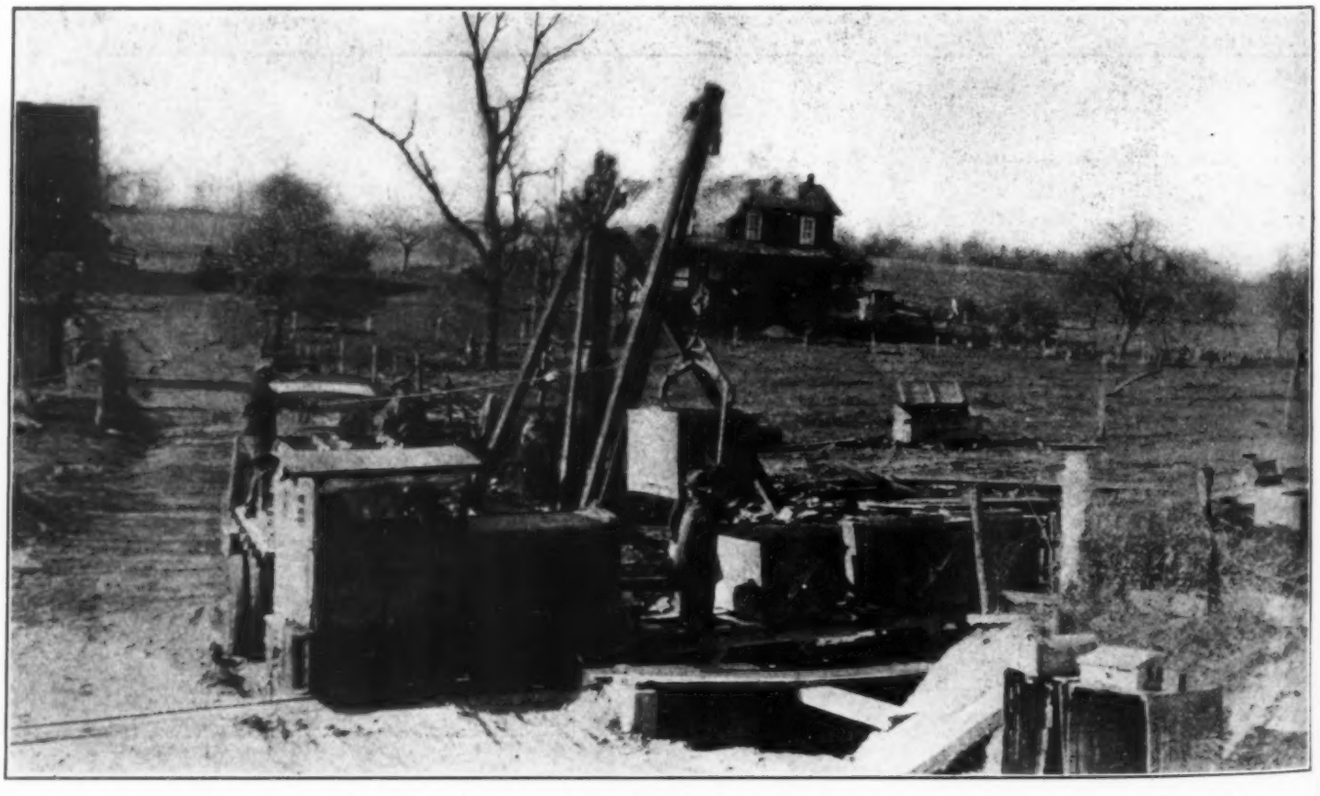
By John H. Anderson

A GOOD example of the application of railroad construction methods to heavy highway construction is found in the operations of Harrison & Co. of Martinsburg, W. Va., on Section 2 of Route 51 in Somerset County, Pennsylvania, between Berlin and Garrett. Harrison & Co. are old railroad contractors, and their experience in handling heavy excavation stood them in good stead on this project, on which the average excavation was 19,430 cu. yd. per mile, and the total 136,000 cu. yd. A steam shovel, served by three 18-ton locomotives hauling 4-yd. side dump cars, comprised the earth-moving equipment used on the heaviest cuts. This was supplemented by two smaller steam shovels, served by teams and dump wagons.

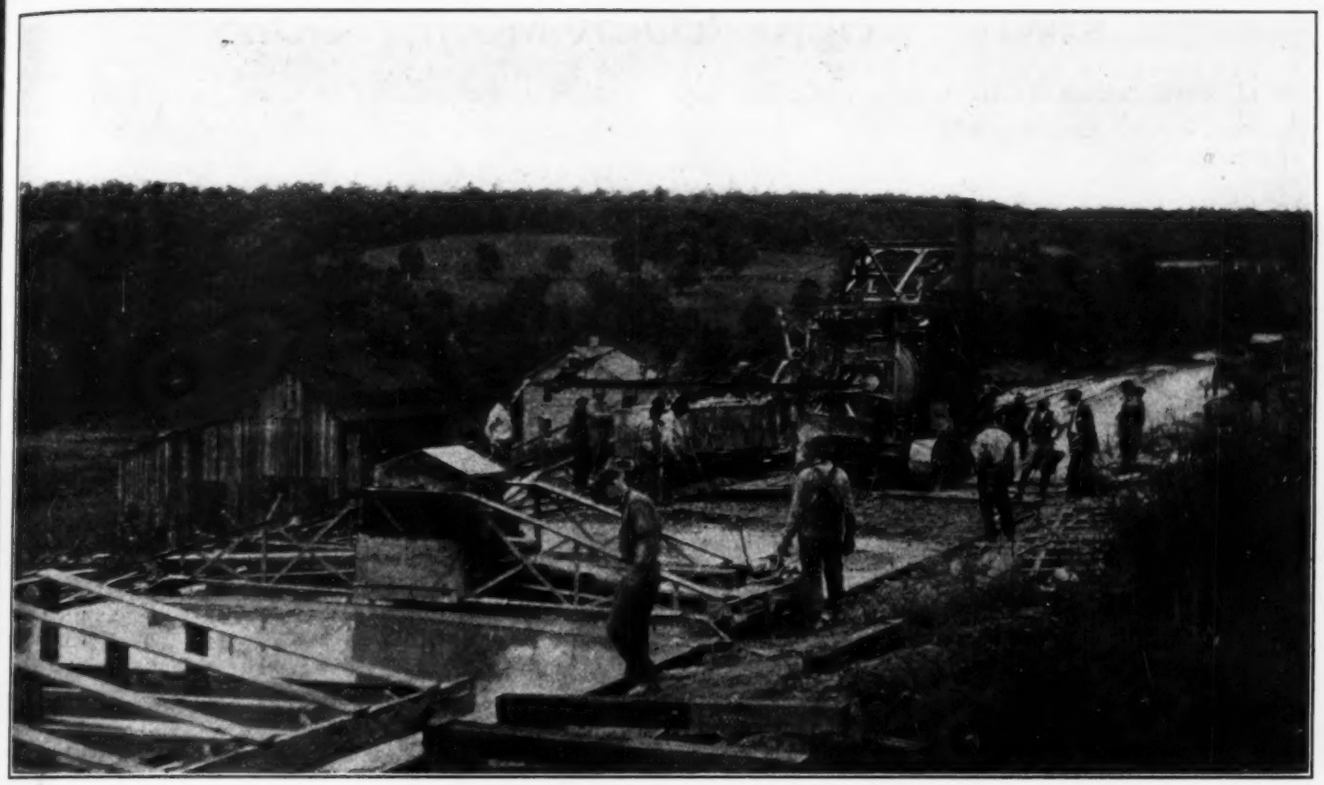
BEGINNING THE JOB WITH A STEAM SHOVEL.

Section 2 of Route 51 consists of 7.08 miles of 18-ft. reinforced concrete pavement, 6 in. thick at the sides and 8 in. at the center, of a 1-2-3 mixture. Unloading points were established at Pine Hill, about ¾ of a mile from one end of the job and a mile to one side,

A 3000 FT. STRETCH OF GUARD FENCE ON THE FINISHED ROAD.



THE TRANSFER POINT WHERE A PORTABLE DERRICK MOVED BATCH BOXES FROM TRUCKS TO CARS.



THE PAVER AND FINISHING MACHINE AT WORK.

and at Shober, about 2½ miles from the other end of the road and immediately adjacent to the road. Both of these unloading points were located on the Baltimore & Ohio Railroad.

Due to the excessively steep grades leading from Pine Hill to Route 51, a combined light railway and motor truck haulage plant was decided upon. Material was hauled in batch boxes on motor trucks, each box containing complete materials for a four-bag batch of 1-2-3 concrete, and each 5-ton truck carrying four such boxes. A transfer point was established on Route 51, where a portable derrick transferred the batch boxes from the motor trucks to light railway cars. Inasmuch as the unloading point at Shober was immediately adjacent to the road, complete light railway haulage was employed from this point. Materials were hauled from Pine Hill for the construction of 12,877 ft. of road, while the unloading point at Shober was used for the construction of 25,045 ft. of road.

Route 51 is rather peculiar in that 2½ miles of it, constructed with material hauled from Pine Hill, lies on a ridge, while the remaining portion, constructed from Shober, is in the valley and along the hillside. The most interesting feature of this operation is the successful use of light railway on grades of 8 per cent.

Like all other contractors, Harrison & Co. were seriously handicapped during 1920 by shortage of material. During that year and the late fall of 1919 they built about 12,000 ft. of road, and completed all of the grading. In 1921 concreting was started on May 18, and a total of somewhat more than 25,000 ft. of pavement was laid between that time and September 3. This is at the rate of 1½ miles of road per month, the Pennsylvania specifications requiring that the concrete be mixed a minimum of 1¼ minutes.

A paving mixer with a four-bag capacity and a finishing machine laid and finished the concrete. The subgrade was trimmed with a subgrader.

The tunnel system of storing and rehandling of material was used at Shober, while at Pine Hill, due to lack of room, a 200-cu.-yd. bin was erected. The material yard at Shober was laid out in a compact and economical manner.

The sand and gravel were brought in on a siding of the Baltimore & Ohio Railroad and were unloaded by two derricks. The stock piles were made over tunnels and two sheds between the standard and narrow gage tracks took care of the cement.

A view of the finished work is illustrated in one of the photographs, which shows a continuous guard fence 3000 ft. long. The high quality of the work and the care taken in its construction is evidenced by this photograph.

E. P. H. Harrison, president of Harrison & Co., was in direct personal charge of the operations on this project, and he was assisted by C. A. Swanson, a member of the firm. Both Mr. Harrison and Mr. Swanson have had extensive experience in heavy construction of all kinds, particularly railroad construction. Mr. Harrison is one of the pioneer railroad engineers of this country and many of the railroads in western Pennsylvania were constructed under his supervision more than forty years ago. The high-class workmanship on this project and the thoroughness and economy of the organization are ample evidence that Harrison & Co. are thoroughly experienced in the handling of large and difficult construction projects.

KNOW WHERE YOUR MONEY GOES

If You Keep Your Costs Accurately You Will Keep Some Cash as Profits

By James J. Redding
Of Cox, Komarek & Redding, Chicago, Illinois

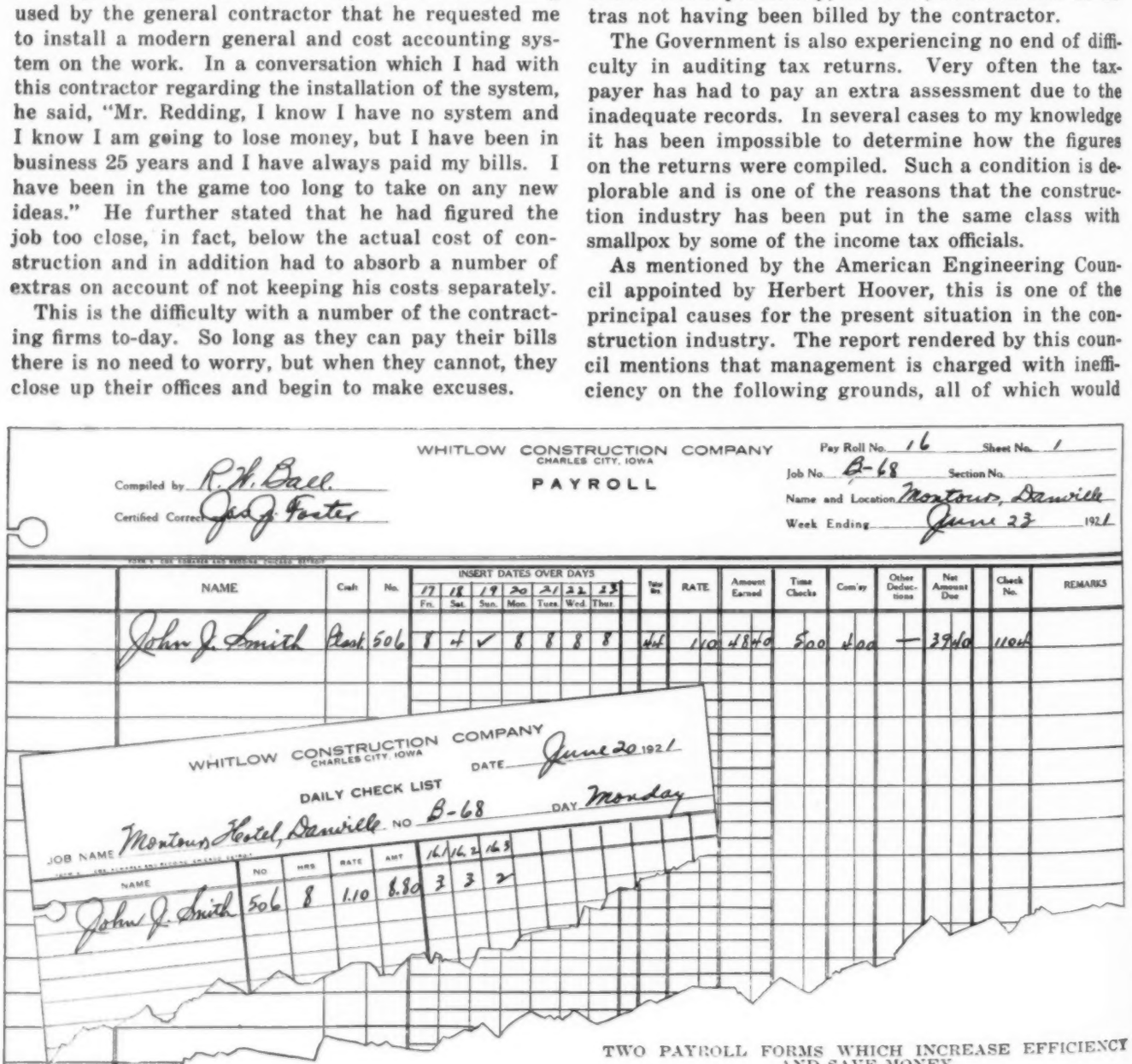
THE subject of costs in the construction industry is being given more consideration each year, as its importance is fully realized when the bills are taken out of the drawer to the right and the money out of the drawer to the left and it is found that there are still a number of unpaid bills at the close of the season. This is the situation with entirely too many contractors, and I am beginning to think that it will ever be so. Recently the owner of a hotel building in the course of erection was so thoroughly disgusted with the system of accounting used by the general contractor that he requested me to install a modern general and cost accounting system on the work. In a conversation which I had with this contractor regarding the installation of the system, he said, "Mr. Redding, I know I have no system and I know I am going to lose money, but I have been in business 25 years and I have always paid my bills. I have been in the game too long to take on any new ideas." He further stated that he had figured the job too close, in fact, below the actual cost of construction and in addition had to absorb a number of extras on account of not keeping his costs separately.

This is the difficulty with a number of the contracting firms to-day. So long as they can pay their bills there is no need to worry, but when they cannot, they close up their offices and begin to make excuses.

During the last several years I have had occasion to check the costs on a large number of projects. On at least four of them the contractors lost heavily, due to inadequate accounting systems. On one there was no system of any kind except a notebook in the contractor's pocket. I do not know how he made out his income tax return for he could not even say how much money was received and how much was disbursed. The nearest we could come to the actual result was in the discovery that he overran his estimate $70,000. There was a possibility, however, of a number of extras not having been billed by the contractor.

The Government is also experiencing no end of difficulty in auditing tax returns. Very often the taxpayer has had to pay an extra assessment due to the inadequate records. In several cases to my knowledge it has been impossible to determine how the figures on the returns were compiled. Such a condition is deplorable and is one of the reasons that the construction industry has been put in the same class with smallpox by some of the income tax officials.

As mentioned by the American Engineering Council appointed by Herbert Hoover, this is one of the principal causes for the present situation in the construction industry. The report rendered by this council mentions that management is charged with inefficiency on the following grounds, all of which would


WHITLOW CONSTRUCTION COMPANY
CHARLES CITY, IOWA
PAYROLL

Compiled by R. W. Ball
Certified Correct Jas J. Foster

Pay Roll No. 16 Sheet No. 1
Job No. B-68 Section No.
Name and Location Montour, Danville
Week Ending June 23 1921

NAME	Cash	No.	INSERT DATES OVER DAYS 17 Fri.	18 Sat.	19 Sun.	20 Mon.	21 Tues.	22 Wed.	23 Thur.	Total Hrs	RATE	Amount Earned	Time Checks	Com'sy	Other Deductions	Net Amount Due	Check No.	REMARKS
John J. Smith	Rest	506	8	4	✓	8	8	8	8	44	1.10	48.40	5.00	4.00	—	39.40	11041	

WHITLOW CONSTRUCTION COMPANY
CHARLES CITY, IOWA
DATE June 20 1921
DAILY CHECK LIST
JOB NAME Montour Hotel, Danville NO B-68 DAY Monday

NAME	NO	HRS	RATE	AMT	16	16.2	16.3
John J. Smith	506	8	1.10	8.80	3	3	2

TWO PAYROLL FORMS WHICH INCREASE EFFICIENCY AND SAVE MONEY.

be taken care of automatically by a modern cost accounting system.

1. *Failure to furnish continuity of employment.*
2. *Failure to plan work in sufficient detail.*
3. *Lack of proper schedules to allow proper co-ordinating of scheduling, purchasing, delivery with job requirements.*
4. *Lack of standards and adequate cost methods as a means of checking production.*
5. *High labor turnover.*
6. *Failure to use proper amount or type of equipment and general failure to develop more mechanical equipment.*
7. *Waste of material through careless handling and improper plant operations.*

The report continues:

"Haphazard management in planning and controlling work and lack of standards, which often double the labor cost, characterize most construction undertakings. Here, again, a few builders, *recognizing the waste in money and man power,* are adopting methods that approach modern factory management."

I am of the opinion that the Council was correct in its use of the word "few," for that is the result of my experience. I believe that not more than 15 per cent of the contractors doing business to-day are able to tell on what class of the work in progress they are making or losing money, and the same percentage at the conclusion of their jobs are still unable to prepare this information.

In talking with some contractors recently they mentioned the fact that it was a good thing for them that the Government passed the Income Tax law, for they were compelled to keep books, and they readily saw where it was of great advantage to them.

When considering road jobs at a lump-sum figure the very basis of a practical cost system is ignored, that is, unit prices.

Some states have the bad practice of saying that they would not authorize the construction of highways at figures in excess of so much per mile. This is not a practical way to handle the letting of contracts for it can readily be seen that if the state were to set a limit of say $30,000 per mile it would not be just and equitable. Take, for example, a strip of highway 8 miles long with few culverts, no bridges and no cuts or fills let at a figure of $30,000 and compare it with a stretch 5 to 8 miles with a number of culverts, one or more bridges and steam shovel excavation. It can be seen readily that it is impossible to put the one stretch on the basis with the one let at $30,000 per mile.

By having a modern cost system on any kind of construction work it is possible to make a careful analysis of all items entering into the cost and to determine the actual amount expended for such items as transporting equipment, unaccounted empty cement sacks, unloading, rehandling and storing of material, demurrage and freight charges, maintenance of equipment, small tools and equipment, liability insurance, interest and traveling expenses. These are the items which cause the contractor the most grief, and from my experience I have found that at least one or more are overlooked or underestimated in preparing the estimate.

"Estimate the small items and the large items will take care of themselves," is an axiom in a contractor's success. In order to prepare an intelligent estimate it is necessary to use approximate unit costs and it can be seen readily that the contractor who has a modern cost system is the one who can be more sure of his estimate, who can feel that he is submitting an intelligent estimate and who need not worry about accepting the job if he is the low bidder.

In adopting a general and cost accounting system care should be exercised to see that it is not too complex, for a system that is too elaborate is just as bad as one carried in a vest pocket. There should be a minimum of forms and at the same time they should be practical, so that the superintendent and accountant on the job can prepare them without consulting a manual every time it is necessary to make one out.

The contracting industry is one of the few in which a uniform general and cost accounting system can be installed universally with but few changes. The first step in installing such a system is to make an analysis of the method of doing business and lay out the system accordingly. Wherever possible all of the accounting should be done in the main office, thus relieving the job office of much detail accounting. However, on some jobs it will be more convenient to do all of the accounting in the job office and to furnish the main office with a weekly or semi-monthly progress and cost report.

Some of the forms that are of considerable importance in keeping a payroll properly are shown on these pages. The large payroll sheet shown on the preceding page has been used by a number of contractors with success. It saves labor in preparing the payrolls and at the same time gives accurate information in regard to what each employee has done. The daily check list form is valuable, as it enables the employer to know at the end of each day how much each man has earned.

The form at the bottom of this page is the employment slip that should be filled out by every employee before he is allowed to start on the job. It gives his complete record and serves to identify him in case of accident or other trouble.

In a succeeding article I shall give a more detailed explanation of the use of these forms, as well as of others which will be illustrated.

To many contractors the use of so many forms may seem like unnecessary "red tape," but these forms have been developed as a result of experience which showed the need for them. They simplify the contractor's work if they are used properly.

FORM NO. 1 COS. KOHARSEN AND REDDING

WHITLOW CONSTRUCTION COMPANY

EMPLOYMENT SLIP

Date Employed SEPT. 8. 1920

Name SMITH JOHN J.

Occupation Plasterer

Number 506 DATE 9/8/20 | RATE 1.00 | 1.10

Present Address 5609 Grand Ave

In Case of Accident Notify Mrs. John J. Smith

5609 Grand Ave Milwaukee, Wis

Approved Jas. J. Foster

Title Pres.

EVERY EMPLOYEE SHOULD FILL OUT A CARD LIKE THIS BEFORE HE IS PERMITTED TO START WORK

ARTHUR BENT OF LOS ANGELES

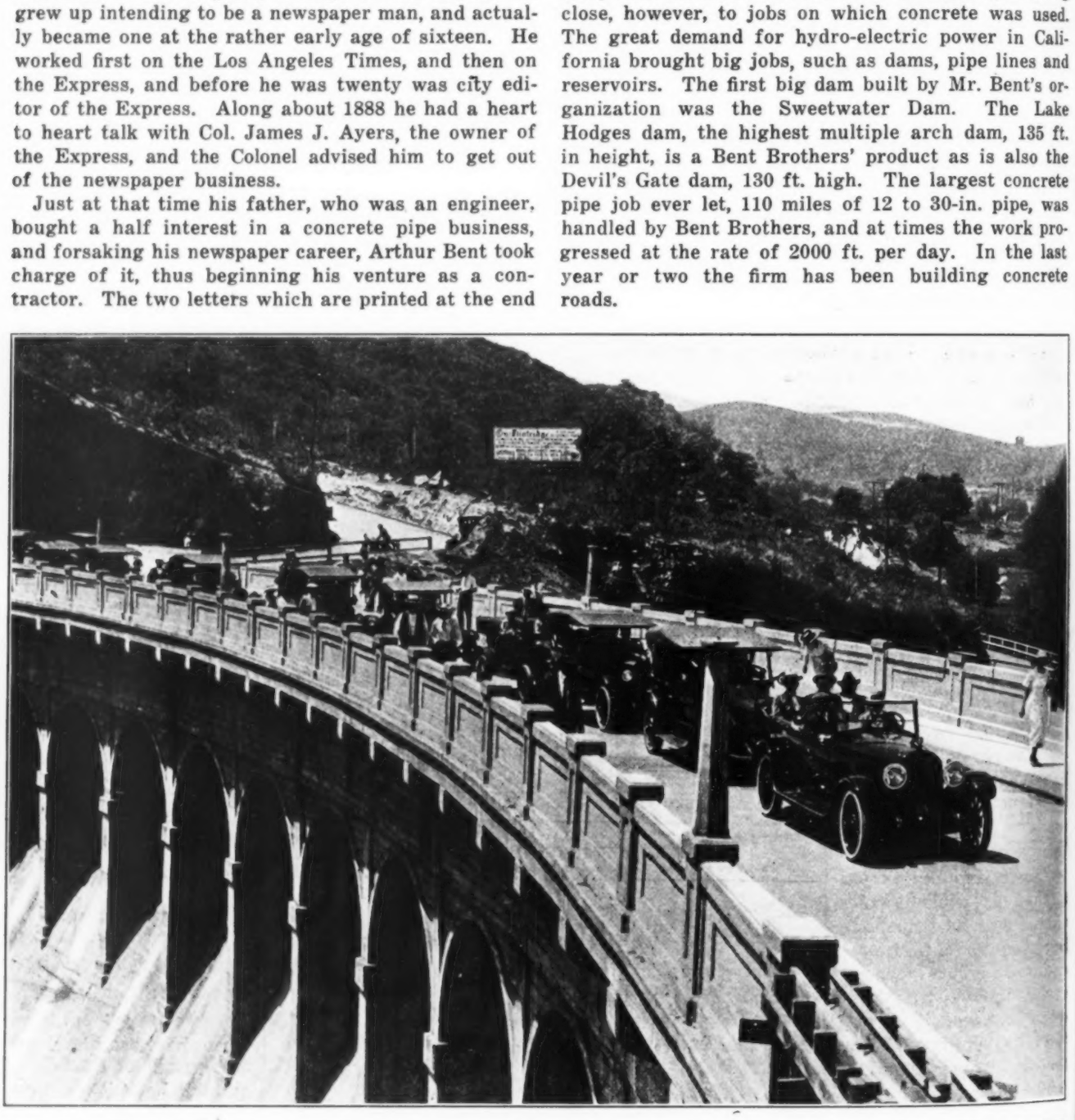
A Successful Contractor Who Entered the Field Via the Newspaper Route

THE best way to become a contractor seems to be to set your heart on being something else. From time to time SUCCESSFUL METHODS has printed articles telling how the country's leading contractors achieved their leadership and in a surprisingly large number of cases circumstances rather than choice have made successful contractors of men who intended to follow some other vocation.

Arthur S. Bent, senior member of the firm of Bent Brothers of Los Angeles, belongs to this class. He grew up intending to be a newspaper man, and actually became one at the rather early age of sixteen. He worked first on the Los Angeles Times, and then on the Express, and before he was twenty was city editor of the Express. Along about 1888 he had a heart to heart talk with Col. James J. Ayers, the owner of the Express, and the Colonel advised him to get out of the newspaper business.

Just at that time his father, who was an engineer, bought a half interest in a concrete pipe business, and forsaking his newspaper career, Arthur Bent took charge of it, thus beginning his venture as a contractor. The two letters which are printed at the end of this article show how good a beginning he made.

And the standard set more than three decades ago has been maintained. Bent Brothers are still doing jobs that will last. For the first 10 years the efforts of the new firm were concentrated on concrete pipe work for irrigation systems and nothing else was attempted. "Do one thing at a time and do it well," was the principle that Mr. Bent adopted right at the start. It proved a good plan of campaign and gradually the firm branched out into other work, sticking close, however, to jobs on which concrete was used. The great demand for hydro-electric power in California brought big jobs, such as dams, pipe lines and reservoirs. The first big dam built by Mr. Bent's organization was the Sweetwater Dam. The Lake Hodges dam, the highest multiple arch dam, 135 ft. in height, is a Bent Brothers' product as is also the Devil's Gate dam, 130 ft. high. The largest concrete pipe job ever let, 110 miles of 12 to 30-in. pipe, was handled by Bent Brothers, and at times the work progressed at the rate of 2000 ft. per day. In the last year or two the firm has been building concrete roads.



THIS IS ARTHUR BENT'S IDEA OF THE WAY A BIOGRAPHICAL ARTICLE SHOULD BE ILLUSTRATED. WHEN ASKED FOR HIS PHOTOGRAPH HE PRODUCED THIS PICTURE OF THE DEDICATION OF THE DEVIL'S GATE DAM. "MY BROTHER STANLEY AND I ARE IN THE SECOND AUTOMOBILE," HE EXPLAINED

Big as it is, California isn't large enough to furnish enough jobs to keep Bent Brothers busy and they have done work in half a dozen other states and in Mexico as well.

Arthur Bent's younger brother, H. Stanley Bent, joined the organization, first as a superintendent on one of the jobs, and later became general superintendent. Bent Brothers, the present firm, was organized about 5 years ago.

At present Bent Brothers are doing about $1,000,000 worth of business a year and make it a point not to take more work than they can handle efficiently. Mere volume of business means nothing to Arthur Bent unless he can take care of it properly. That is one excellent reason for the firm's success.

The Bent Brothers system of advertising their wares is probably a heritage from Arthur Bent's newspaper days. Post card photographs of interesting features of Bent jobs are sent out every month or two to men interested in construction work all over the country. As a result, the name of Bent Brothers is one of the best known in the construction business. It is a plan which other contractors might do well to adopt.

Arthur Bent's leadership in the construction field also is proved by the fact that his brother contractors have honored him by electing him a director of the Associated General Contractors. He also was president of the Southern California chapter of the A. G. C. and the nominating committee this year made a valiant but unsuccessful effort to persuade him to retain that post. He is a big man in the construction field and he has earned that distinction. The following letters tell their own story.

Water Department of the City of Los Angeles
Los Angeles, April 23, 1911.

Bent Brothers,
Los Angeles.

Gentlemen: It might interest you to know that I have recently taken up the three and one-half miles of 24" concrete pipeline laid by you many years ago (in 1888) in the Zanja System of the City of Los Angeles. This pipe was in constant use for about fifteen years and it was removed by reason of the abandonment of the Zanja in which it was laid.

I found the condition of this pipe to be remarkably perfect in every way, and while in many places it passed through sections that were covered with vegetable growth, no roots ever penetrated its joints. The body of the pipe I found to be as hard and sound almost as granite rock and of remarkable density of grain.

It is such facts as these that give an engineer confidence in the efficiency and durability of a well-laid concrete pipeline and warrant its more extensive use in the future, as water supplies become more valuable.

Very respectfully yours,
(Signed) WM. MULHOLLAND,
Chief Engineer,
Los Angeles Aqueduct.

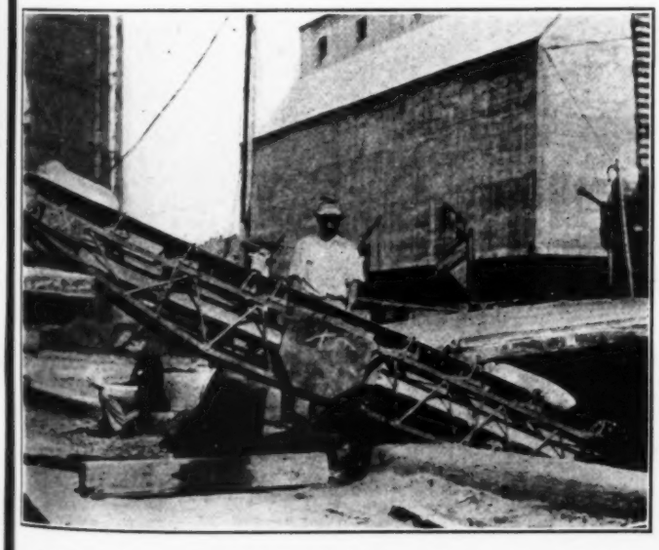
Gardena, Cal., March 5, 1919.

Messrs. Bent Brothers,
Los Angeles.

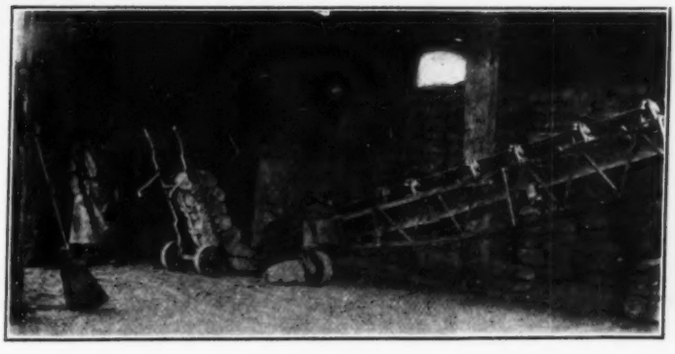
Gentlemen: The Board of Directors of the Gardena Water Supply Company met this morning and in response to your inquiry directed me to write you that so far as we know the 18", 20" and 22" Concrete Pipeline you put in 32 years ago, is as good today as ever. It has been in constant service ever since you installed it.

Yours truly,
S. DUNN, Secretary,
Gardena Water Supply Company.

CONVEYOR SHOWS LOW COST IN HANDLING BAG CEMENT



TO get a comparison between the cost and time necessary to handle bag cement by hand labor and by mechanical means, the United States Structural Steel Company, contractors on the new Hell Gate power plant of the New York Edison Company, recently tried out a 33-ft. 18-in. smooth belt conveyor run by a 5-hp., 2-phase electric motor. The cement is received in lighters carrying about 9000 bags each. One of the illustrations shows the interior of the lighter and the other the exterior. The exterior picture was taken when the tide was at low ebb and shows the conveyor working at an angle of about 30 degrees. The unloading from the lighter and the loading of the trucks by hand required from 12 to 15 men, depending upon the tide, and from 15 to 25 minutes per truck. By means of the conveyor one truck was loaded using 8 men in an average time of 7 minutes. The trucks were loaded with 150 bags each, and the saving of truck time as well as labor was considerable. Also when hand labor is used, unloading cannot be done if the barge is deeply loaded during about 2 hours of low water. The above figures are the average for a week's run of the conveyor.



A WELL ORGANIZED CONCRETE PLANT

River Between Mixer and Work Furnishes Real Problem

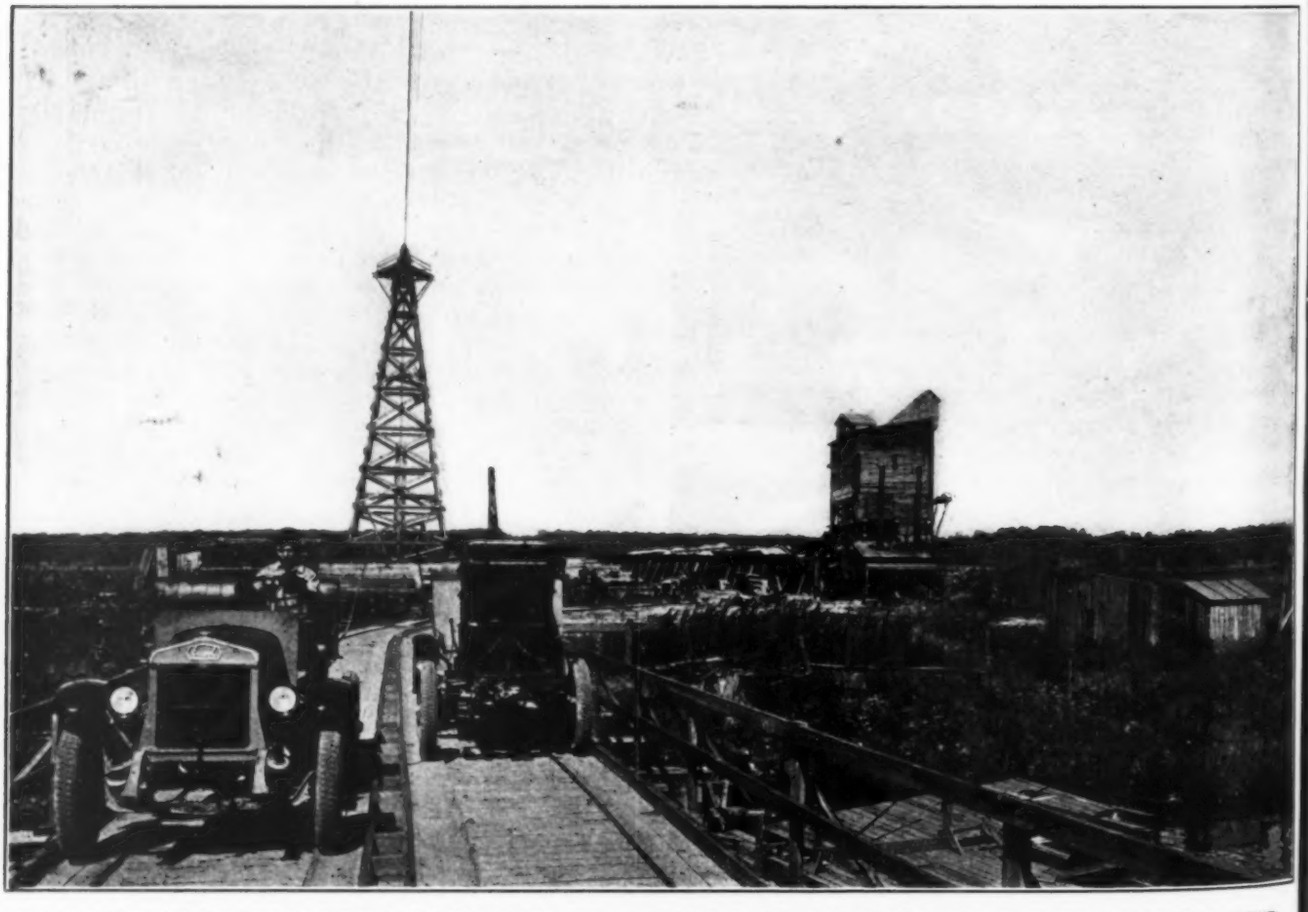
ISOLATION by the Illinois River from the railroad was the salient feature which Green & Sons Company had to consider in designing their concrete plant layout for the construction of Lock No. 4, near Marseilles, Ill., for the State of Illinois. This lock is part of the Chicago to the Gulf waterway project.

DROPPING THE CONCRETE INTO THE WALL FORMS THE BASE OF WHICH IS 50 FEET BELOW

As described in the September issue of SUCCESSFUL METHODS, a temporary trestle so built that it can be taken out in sections when the rapid and frequent rise of the river or ice jams make it necessary, was built to overcome this isolation. One of the photographs shows the bridge with guide ways for trucks to prevent collisions on 12-ft. roadways. Overhead, and directly in line with this bridge may be seen the cableway. When concreting is stopped this fall the bridge will be removed by means of the cableway and replaced in the spring as soon as the run-off permits. In this picture the concrete plant also may be seen.

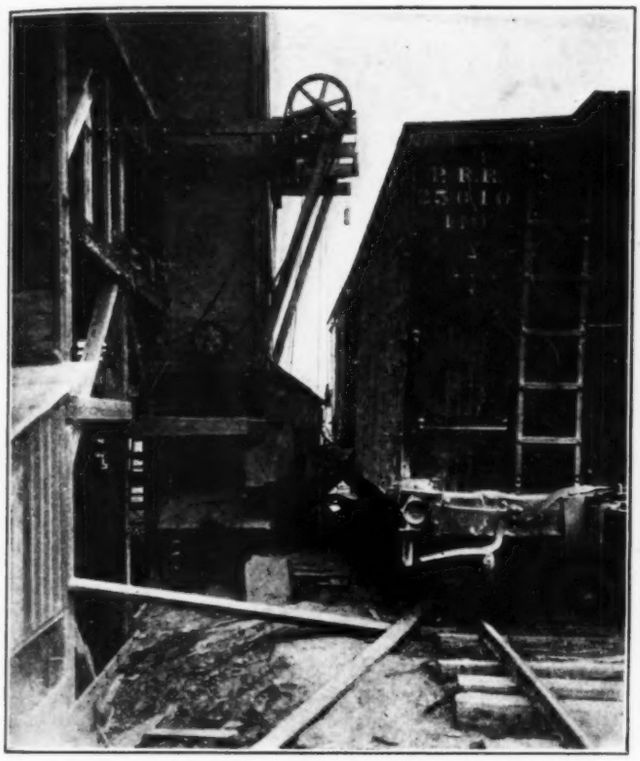
A fleet of six 2-ton trucks with automatic dump bodies handle 1 cu. yd. of mixed concrete over the bridge and discharge into a hopper controlled by a gate and through chutes to the wall forms, the base of which is 50 ft. below. The trucks average less than 10 minutes for the round trip from mixer to dump, an average distance of about 4,000 ft.

Pit run gravel is received in dump cars which discharge into the inclined bins. Underneath these bins there is a belt conveyor which carries the gravel to a bucket elevator where it is raised to bins above the

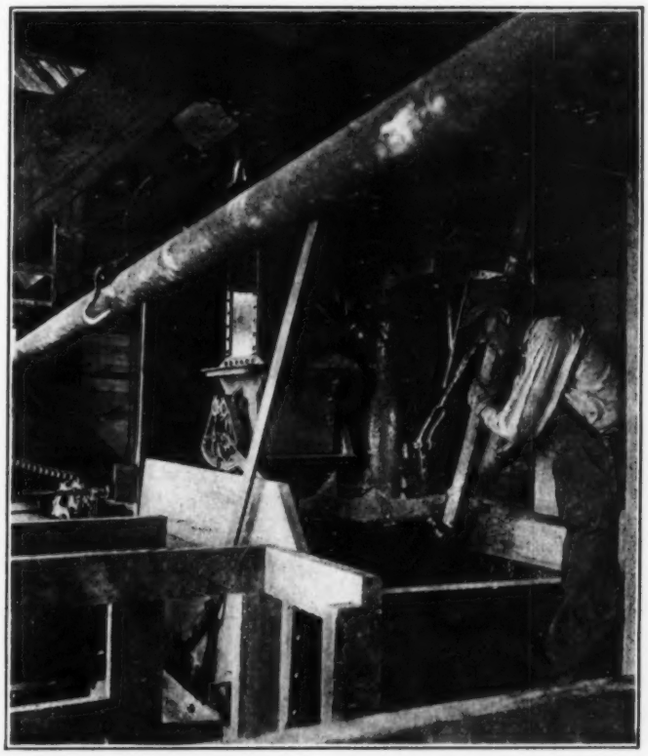


TEMPORARY BRIDGE OVER THE ILLINOIS RIVER. THE CONCRETE PLANT MAY BE SEEN IN THE BACKGROUND.

mixer. Cement is received in bulk and one of the illustrations shows how a power shovel handles the cement into the boot of the bucket elevator which handles it to the bins above. For delivering the cement from above to the hopper which charges the mixer a steel cylinder is used. For admission of cement to the cylinder there is a roller gate above, and a slide gate below empties the charge into the hopper Proportioning or measuring is thus done in the cylinder. By means of small circular sheels fitting the bottom of the cylinder, the mix may be varied from 1.1 bbl. to 1.3 bbl. to the batch. Two 1-yd. concrete mixers complete the plant, which has been in successful operation since the work of concreting began several weeks ago.



UNLOADING BULK CEMENT FROM BOX CAR.

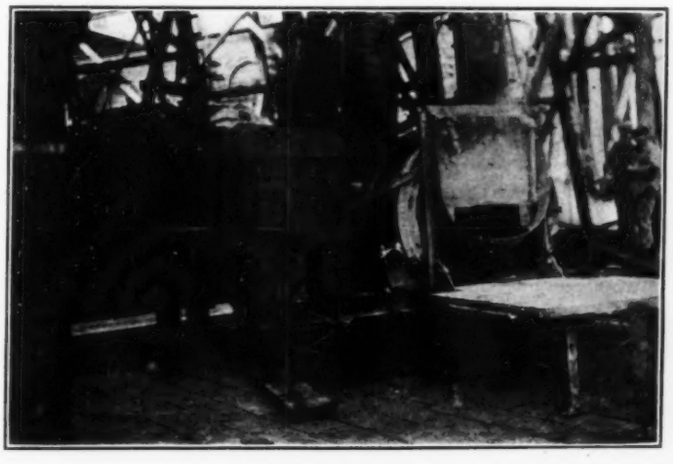


PROPORTIONING CYLINDER FOR CEMENT WHICH DISCHARGES INTO CHARGING HOPPER.

The superintendent of the work is Roy Shackleton, and the photographs were taken by R. A. Bonnell, engineer for Green & Sons.

SMALL MIXER ON BIG JOB

THAT large jobs do not always call for large machines is recognized by large contractors—namely, the Stone & Webster Corporation, who are building an addition of considerable size, as well as 400 ft. of concrete discharge tunnel, in connection with the Queensboro Gas & Electric Company's plant at Far Rockaway. For concrete work, which consists of foundations and footings for the building extensions and the tunnel, they are using a 1-bag mixer with which they are pouring 50 cu. yd. of concrete a day. The ease with which this small mixer is moved from place to place, as well as its sturdiness, makes it a very efficient machine on this class of work, where, though the yardage may be considerable, it is more or less inacessible.



An obstacle with which the contractor has to contend on this job is the maze of overhead wires which parallel the site of the tunnel. In order to put down the 4-in. splined sheathing a mast carrying a 5000-lb. steam hammer was rigged on rollers close up to the sheathing. A 2-drum hoisting engine, which travels, with the mast clearing the poles, handles the hammer. For driving piles where the wires will not allow this rig to be used, piles were put down by digging underneath and then driving down with a 500-lb. hammer rigged as a yo-heaver to a gin pole. B. M. Cowan is superintendent on this job.

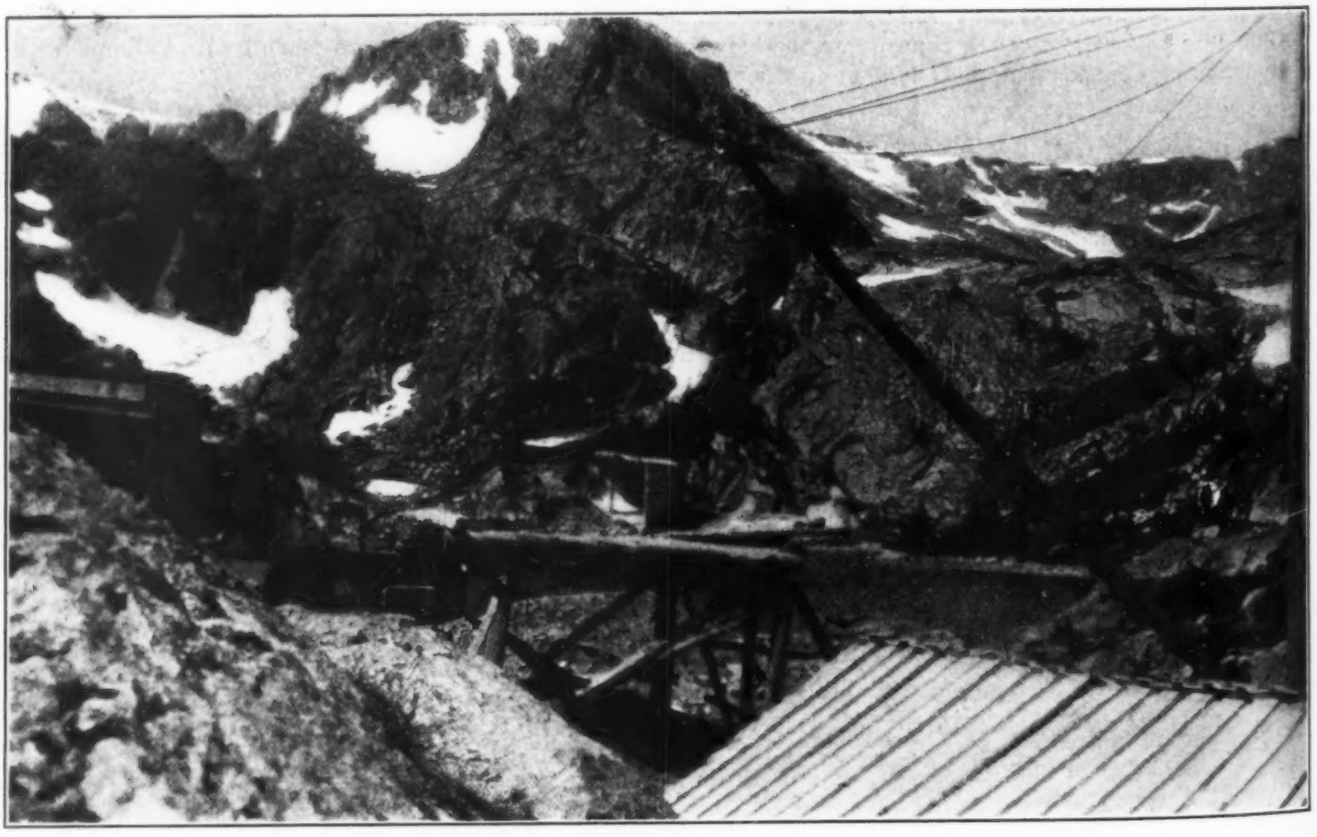
BUILDING A DAM ABOVE THE SNOW LINE

IT seems strange to learn of a construction job in the heart of the United States on which work is limited to the three summer months. That is the situation, however, on the Arbuckle Reservoir Project in Boulder County, Colorado, and the reason therefor is that the dam under construction is located 11,300 ft. above sea level and directly below the Continental Divide in fields of perpetual snow.

The photographs on this page show the situation of the dam. The stone and sand are crushed on the work as they are used, but the cement has to be brought up on burros over a 6-mile trail. The trail is steep and rough and also swampy in some places, and many of the heavier parts of the machinery had to be transported over the snow on sleds.

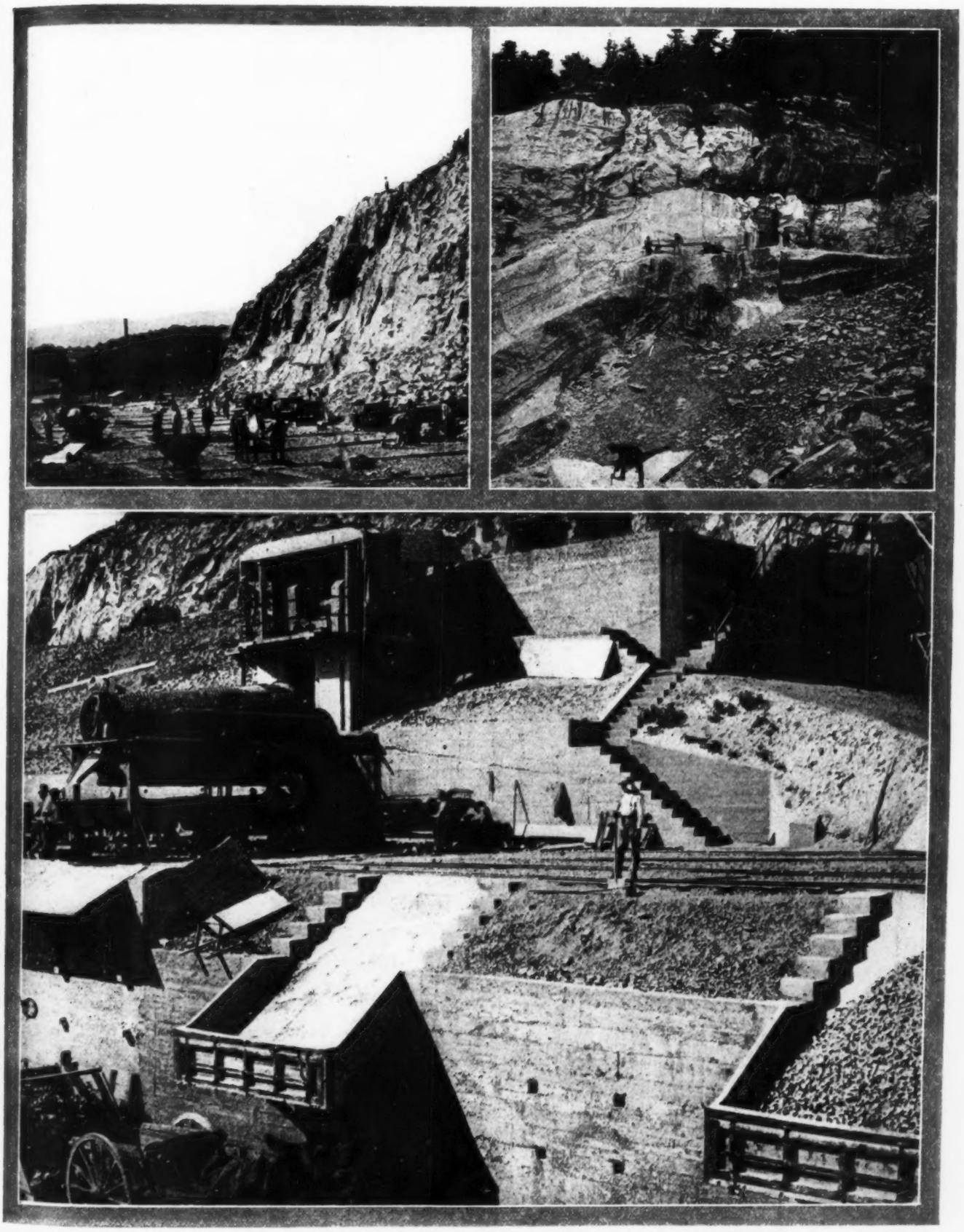
The dam will be 203 ft. long on the crest and 572 ft. high from the bottom of the outlet. On the north end 130 ft. of the dam is of the arch type with a 96-ft. radius reinforced with 1-in. twisted steel bars 32 ft. long. The south end of the dam is of gravity type. About 1250 cu. yd. of concrete will be required to finish the work and about 12,500 lb. of reinforcing will be used.

The Arbuckle Reservoir will hold 1500 acre-feet of water and will furnish water for irrigation near Longmont, Col. Walter McCaslin is president of the company handling the project and L. H. Dieterich has had charge of the project during the last two years.



TWO VIEWS OF THE ARBUCKLE DAM IN COLORADO, 11,300 FEET ABOVE SEA LEVEL

An Alsatian Quarry in French Hands



The three photographs on this page show how the French are utilizing the resources of Alsace for the purpose of rebuilding that section of France devastated by the war. In the upper left-hand picture the process of getting out the large stones is shown. The upper right-hand photograph gives a general view of the quarry, and the lower photograph is of the crushing plant. © *Keystone Views.*

SPEEDY BRIDGEBUILDING IN MARYLAND

By J. N. Mackall,
Chairman, Maryland State Roads Commission

THE importance of the Baltimore-Washington Boulevard as a carrier of traffic is evident. Therefore, when on September 21, 1921, a 5-ton truck loaded with asphalt tried to pass a runabout on a one-way bridge near Savage, Md., and as a result wrecked the bridge, the Maryland State Roads Commission had a job on its hands.

THE WRECK OF THE OLD STEEL BRIDGE, SHOWING THE TRUCK WHICH DID THE JOB

The commission, in session on the next day, Sept. 22, authorized the chairman to enter into a contract for replacing the old steel bridge with a new reinforced concrete arch. Plans were prepared and three bids were received on Sept. 24. The Luten Bridge Company of York, Pa., bid $19,000, and the contract was awarded to it. The plans called for a span of 97 ft. and a rise of 18 ft. Actual work began on Monday, Sept. 26. The abutments were poured on Oct. 6 and the pouring of the arch rings began on Oct. 10 and was finished on Oct. 12. The first spandrel wall was concreted on the fifteenth, the second was begun on the seventeenth, backfilling was under way on the nineteenth and on Saturday, Oct. 22, at noon, traffic was turned over the bridge. On Sunday, Oct. 23, the macadam roadway was laid and the road opened for the entire width of 24 ft. Ordinarily such a job would have taken about six months.

A MONTH LATER THIS CONCRETE BRIDGE WAS PUT IN SERVICE

PAPER CORES USED IN HOLLOW PILES

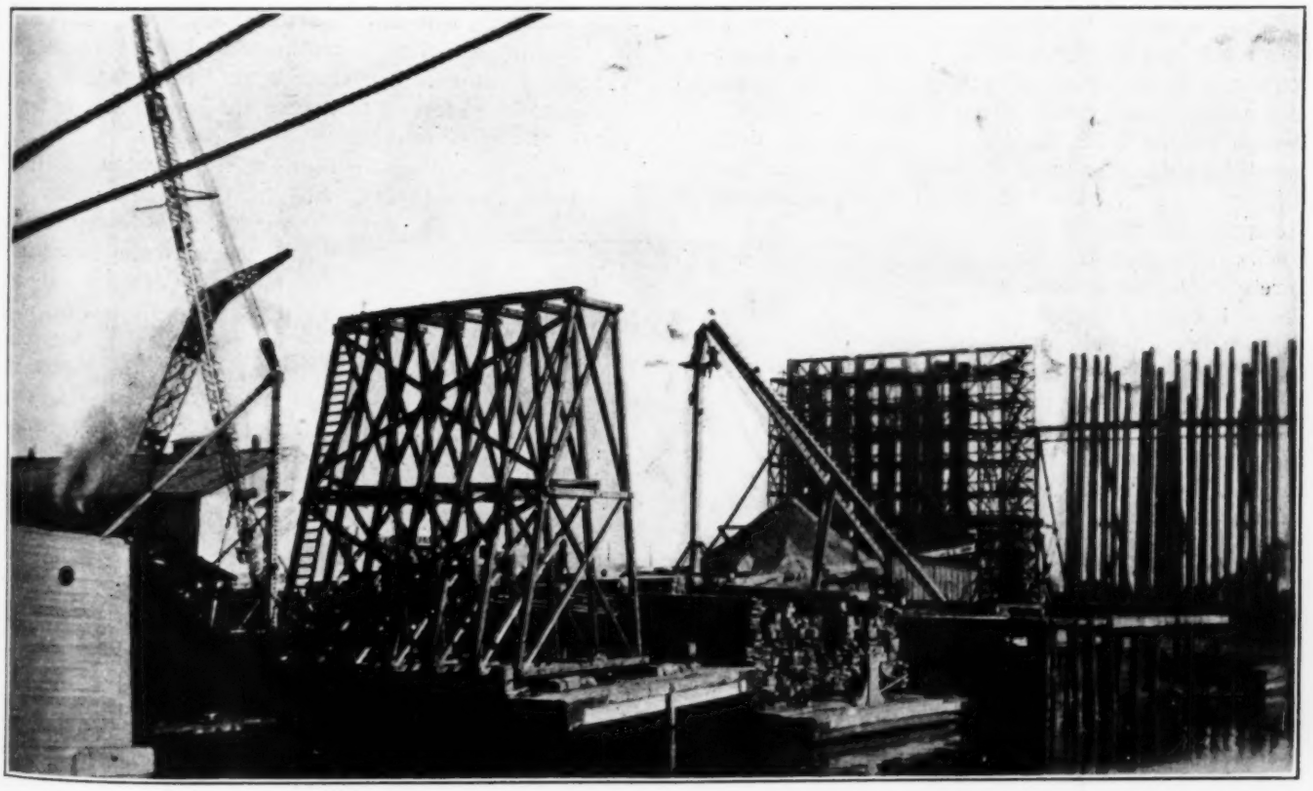
Los Angeles Harbor Department Tries New Type for Building Piers

OUT in California the Harbor Department of Los Angeles is using a hollow reinforced concrete pile which differs considerably from the concrete pile in general use. The piles vary in length from 42 to 60 ft. and in diameter from 18 to 20 in., with a 4-in. ring of concrete, and are made in sections of from 5 to 10 ft. The sections are made by shooting concrete against a core encircled with reinforcing steel. The cores consist of tar or building paper wound around a wooden cylinder and made fast to it by chicken wire and a coat of hot glue. The points of the lower sections are conical in shape and are made of solid concrete, the casing of reinforcing rods being placed in the mold as shown in the illustration.

THE POINTS OF THE BOTTOM SECTION OF PILES READY FOR INSERTION OF PAPER CORES.

When set the sections are removed from the molds and placed in the pile molding rack. This rack is a wooden, scaffold-like structure of eight floors about 6 ft. apart and divided into 10 bays. Each bay has a clear opening for its full height on the front of the structure. A railway for the crane is in front of the rack. Bracing and anchorages are at the back. The bays are made to accommodate 6 piles each, this number being made up at a time. A concrete foundation reinforced with a section of steel rail provides a base for the lower sections, thus preventing them from sinking into the ground as the full length of the piles is built up.

The building of the piles begins by placing 6 of the lower sections or points in a bay and slipping a section of paper core inside of the reinforcing rods which project upward. The cores are made with a slight flare at one end and a contraction at the other which permits the sections to join together in bell and spigot fashion. The points are placed in the bay in such a way as to afford about 8 in. clearance. This allows room for enclosing each core with a 4-in. wall of concrete applied by air pressure. Board partitions are set up in the space between the cores to provide a backing against which to shoot the concrete. These



A GENERAL VIEW OF THE CONSTRUCTION PLANT. THE SCOW ON WHICH THE FINISHED PILES ARE TRANSPORTED IS IN THE FOREGROUND; THE CURING RACKS IN THE BACKGROUND.

partitions are put up in sections about the same height as the cores and are removed just before the final work is done on each section. At the middle of each section and at right angles thereto a single thin strip of wood is placed to prevent the piles from bonding.

After a 4-in. ring of concrete has been applied to the paper core, thus covering the reinforcing, a new section of pile is begun. A long section of core is slipped over the one in the point and other sections of reinforcing rods are lapped with the ones in the point and wired in place. This operation is continued until the pile is completed.

The man operating the pneumatic apparatus begins at the bottom and works upward from floor to floor. One section is finished at a time by going entirely around the cluster of six piles before moving to a higher section. A steel plate designed to resist the impact of the pile-driver is set in the top of the finished pile.

The concrete is applied with air pressure of 35 lb. to the square inch and with a nozzle especially designed to permit the passage of ½-in. rock. The mix is 1 : 1½ : 2½.

After the piles have stood in the shooting rack for about 15 days they are picked up by the locomotive crane and placed, one at a time, in the curing rack, where they remain in a vertical position for the next 30 days. They are then conveyed to the work in a scow which is fitted with a rack similar to the curing rack, the idea being to keep the piles in a vertical position at all times and thus prevent them from being subjected to cross-bending strains. Under maximum conditions of loading the piles are expected to carry a load of about 20 tons each. The hollow core renders them lighter in weight, and it is the opinion of the harbor engineers that they will be more durable because the greater density of the concrete shot on by air will protect the pile from the action of the salt water.

The material in which the piles are driven consists of silt and detritus and there is a penetration of from 18 to 30 ft. A 2-in. water jet is used for about two-thirds of the distance and a steam hammer drives them the remaining distance. Two air machines are used and the average capacity of the plant is about 25 piles per week, this average having been made during the rainy season, when weather conditions were not favorable for the work. Attention is called to the fact that should it be deemed advisable in the future to fill the piles, making them solid, this will not be difficult of accomplishment.

More than 1000 of these piles already have been made and piles for another wharf will be started soon. A large number of them have been driven in the harbor of Los Angeles for municipal wharves.

The design for the piles and the method of construction was worked out by J. W. Ludlow, assistant engineer of the harbor, and the construction was carried out by V. R. Sterling, engineer in charge, assisted by F. W. Wadleigh.

HEATING THE CONCRETE TO MAKE IT SAFE

THE photograph, taken in Boston, Mass., shows how the H. C. Harvey Co. carry on their building work in freezing weather. Attached to the 1-bag mixer is a heater by means of which the materials are heated while in the drum by a live pressure flame which passes from the burner through the deflector and plays directly upon the materials while they are being mixed. At the time this picture was taken the temperature was 25 deg. below zero and the concrete came out steaming hot. For the 1-bag mixer shown a 12-gal. tank, which burns 2 gal. of kerosene per hour, is used. The heating apparatus can be detached easily for use in thawing out frozen material piles.

This machine enables the contractor to carry out his concrete work during the winter regardless of temperature and prevents delays and costly shutdowns.

For stretching out the construction season to complete a piece of work in order to avoid running a job over into another season, contractors, such as road builders, who do not usually figure on concreting in freezing weather, sometimes find it to their advantage to do so. For their benefit the general principles to be observed to insure safe work in low temperature are given.

Heat the aggregates and mixing water so that concrete, when placed, will have a temperature of not less than 70 deg. Place concrete in the forms immediately after mixing so that none of its heat will be lost. Protect the concrete as soon as placed in order to retain its heat. Canvas covering, sheathing or a layer of clean straw will furnish sufficient protection for some work. Where work can be enclosed, steam coils, open coke stoves or salamanders may be used for heating. In severe weather such protection should be continued for at least five days. Be sure concrete is strong enough to bear load before forms are removed.

HEATING CONCRETE IN THE MIXER.

CRADLE ATTACHED TO TRUCK SPREADS STONE EVENLY

FOR repairing Rhode Island and Connecticut macadam roads, or in fact, wherever it is necessary to distribute crushed rock in even layers for

road building, Geo. T. Seabury, contractor for the Connecticut State Highway Department, has devised a rig shown in the photographs. It is attached to the truck in which the rock is transported. The rock is dumped into this cradle and is distributed in an even layer of the desired thickness.

CEMENT STORED ON FLAT CARS NEAR MIXER

A STEADY supply of cement at the mixer is assured by the method used by Brereton & Bauck on a road contracting job near Emmetsburg, Ia. Inside the forms is placed a short section of industrial track on which are one or two flat cars. On these cars the bags of cement are piled as they are brought up from the supply shed. This makes it possible to keep a proper supply of cement close to the mixer at all times. The problem of protecting the cement in wet weather also is simplified, as the cars keep the cement off the ground and it can easily be protected during rain by a tarpaulin. The photograph shows the cement piled on the cars.

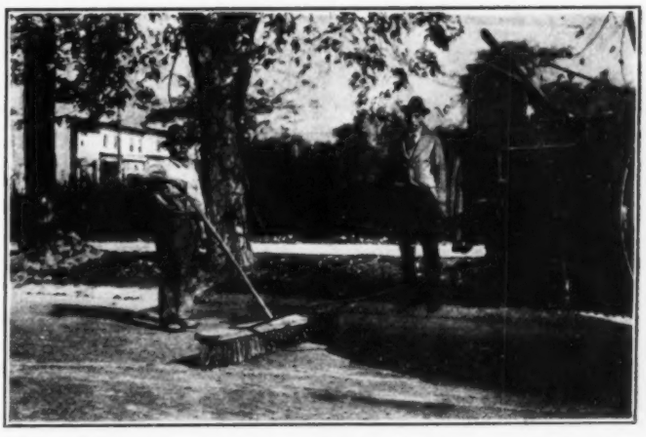
The use of industrial track by Brereton & Bauck is

by no means confined to this short stretch close to the mixer. In fact, industrial track was used even before the actual work of laying concrete began, as the gravel for the job was taken from a pit about six miles away from the road. This gravel was taken out with a dragline and scraper and stockpiled at the pit. Then it was loaded into industrial cars with a bucket loader and hauled over six miles of industrial track to a central storage ground where enough material was stored for the entire job. In the spring the loader and track were moved up to the road and the actual work of laying the concrete began.

TONY INVENTS A BRUSH

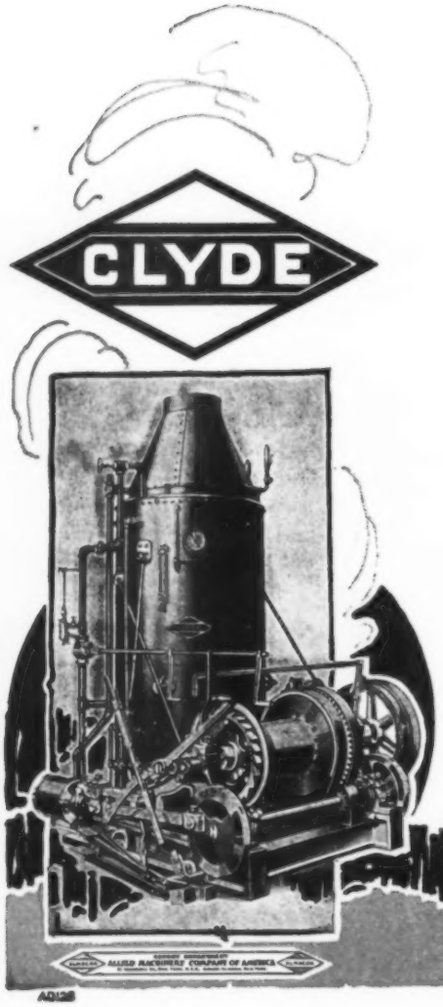
FOR penetration macadam after the base has been laid and has been given a coat of tar, a layer of rock, measuring from one-half to three-fourths of an inch, is placed on top and rolled three or four times until it is reduced to about three-eighths of an inch. As the roller passes over the rock a broom which is attached to the roller, as shown in the photograph, pushes the rock in such a manner that the large rocks are brought to the surface and are gradually reduced to the proper size and the voids filled.

Andrews Brothers, road contractors of Mineola, L. I., used 3 one-man brushes to do this work, until



Tony, their foreman, invented the rig shown in the photograph. The first brush consisted of three single brushes fastened together as one, but the one they are now using is made by the manufacturers in one piece and eliminates two men.

The Builder's Hoist



This engine is designed by the Clyde engineers for the building contractor. Built with all of the care found in other Clyde equipment, it has proven highly successful on all types of construction work.

With easily accessible lever and brake control, semi-steel or steel gears, cut teeth, single or two drum as required, double cylinder with link motion, reversible, it is an all-around adaptable and dependable machine ready at all times to care for an emergency.

It is built in seven standard sizes from 12 to 50 H. P. with cylinders from 4¾"x6" to 9"x10", thus affording a selection that will meet the requirements of any construction problem.

This engine is covered by the usual guarantee against original defects. It is also guaranteed to maintain its advertised horsepower.

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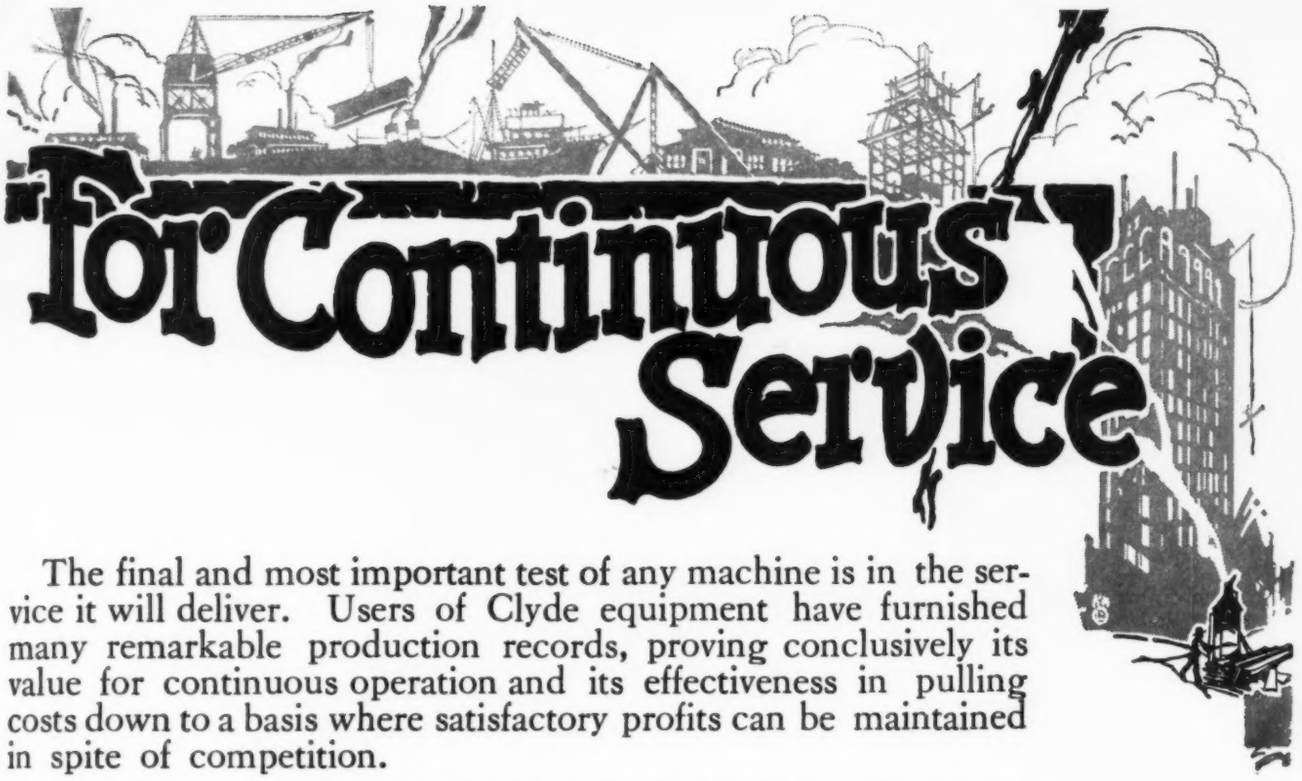

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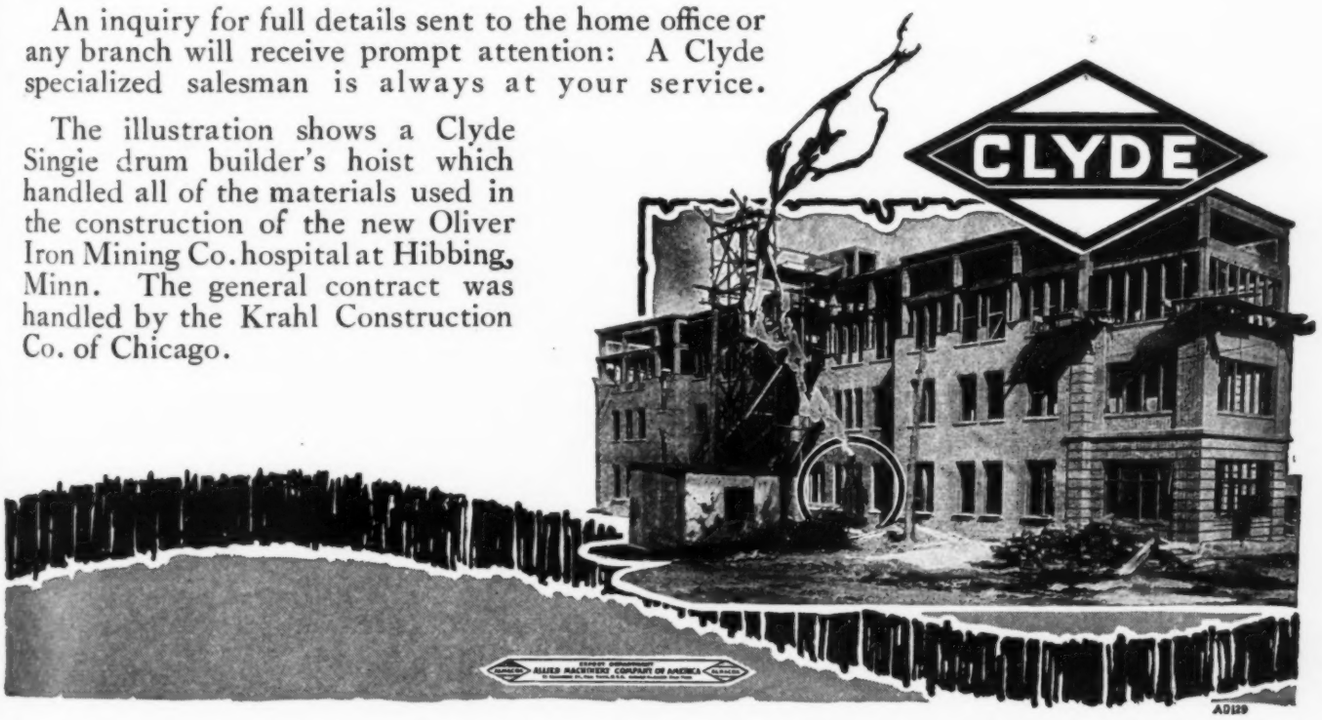
The illustration shows a Clyde Singie drum builder's hoist which handled all of the materials used in the construction of the new Oliver Iron Mining Co. hospital at Hibbing, Minn. The general contract was handled by the Krahl Construction Co. of Chicago.



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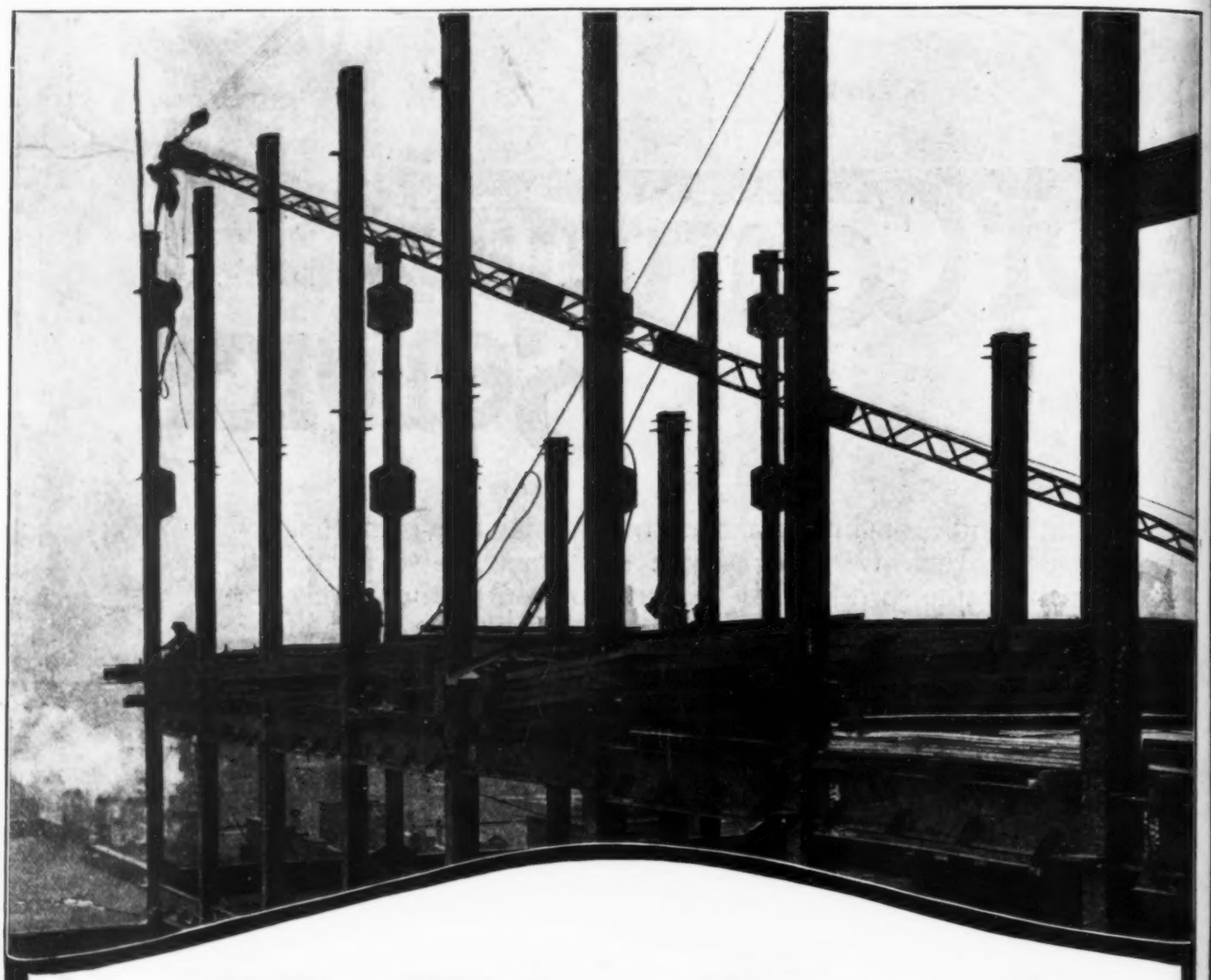

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